Math2210 Quiz 1 (Sections 10.4, 11.1) Summer, 2008 Dylan Zwick

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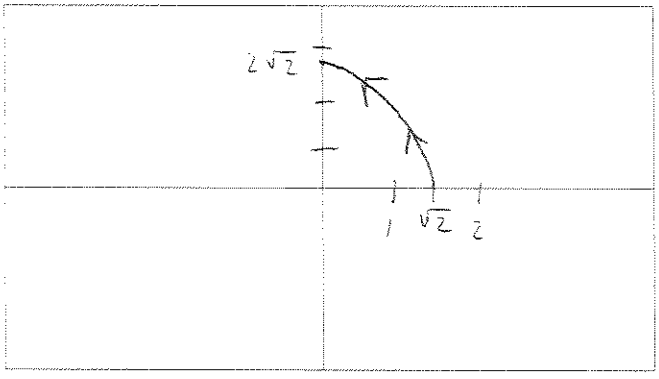
Instructions: Please show all of your work as partial credit will be given where appropriate, **and** there may be no credit given for problems where there is no work shown. All answers should be completely simplified, unless otherwise stated.

1. For $x=\sqrt{3-t}$ and $y=2\sqrt{t-1}$ such that $1\le t\le 3$, eliminate the parameter and graph the curve. Indicate if the curve is simple and/or closed.



$x^2 = 3 - t$

$\Rightarrow t = 3 - x^2$

$y^2 = 4(t-1)$

$\Rightarrow t = \frac{y^2}{4} + 1$

$3 - x^2 = \frac{y^2}{4} + 1$

$\Rightarrow \boxed{x^2 + \frac{y^2}{4} = 2}$

from $t = 1$

$x = \sqrt{2}$

$y = 0$

to $t = 3$

$x = 0$

$y = 2\sqrt{2}$

Simple: (T) or F (circle one)

Closed: T or (F) (circle one)

2. Find the distance between the points (-2, 1, 2) and (4, -3, 6).

$$D = \sqrt{(4--2)^2+(-3-1)^2+(6-2)^2}$$

$$= \sqrt{36+16+16}$$

$$= \sqrt{68} = 2\sqrt{17}$$

distance = $2\sqrt{17}$

3. Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ (without eliminating the parameter) for $x=4t^5$ and $y=-2t^3$ such that $t\neq 0$.

$\frac{dy}{dt} = -6t^2$ $\quad \frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{-6t^2}{20t^4} = -\frac{3}{10t^2}$

$\frac{dx}{dt} = 20t^4$ $\quad \frac{d}{dt}\left(\frac{dy}{dx}\right) = \frac{3}{5t^3}$

$\frac{d^2y}{dx^2} = \frac{3/5t^3}{20t^4} = \frac{3}{100t^7}$

$\frac{dy}{dx} = \underline{\quad -\frac{3}{10t^2} \quad}$

$\frac{d^2y}{dx^2} = \underline{\quad \frac{3}{100t^7} \quad}$

4. Find the equation of the sphere that has the line segment joining the two points in question #2 as a diameter.

The center is the midpoint:

$\left(\frac{4+(-2)}{2}, \frac{-3+1}{2}, \frac{6+2}{2}\right) = (1, -1, 4)$

The radius is 1/2 the diameter

$r = \frac{2\sqrt{17}}{2} = \sqrt{17}$

So, the sphere's equation is:

$(x-1)^2 + (y+1)^2 + (z-4)^2 = (\sqrt{17})^2 = 17$

Center of sphere: $(1, -1, 4)$

Equation of sphere: $(x-1)^2 + (y+1)^2 + (z-4)^2 = 17$